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## Systematic Review and Meta-Analyses

# Factors associated with older people's emergency department attendance towards the end of life: a systematic review

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**Background:** Emergency department (ED) attendance for older people towards the end of life is common and increasing, despite most preferring home-based care. We aimed to review the factors associated with older people's ED attendance towards the end of life. **Methods:** Systematic review using Medline, Embase, PsychINFO, CINAHL and Web of Science from inception to March 2017. Included studies quantitatively examined factors associated with ED attendance for people aged  $\geq 65$  years within the last year of life. We assessed study quality using the QualSyst tool and determined evidence strength based on quality, quantity and consistency. We narratively synthesized the quantitative findings. **Results:** Of 3824 publications identified, 21 were included, combining data from 1565 187 participants. 17/21 studies were from the USA and 19/21 used routinely collected data. We identified 47 factors and 21 were included in the final model. We found high strength evidence for associations between ED attendance and palliative/hospice care (adjusted effect estimate range: 0.1–0.94); non-white ethnicity (1.03–2.16); male gender (1.04–1.83, except 0.70 in one sub-sample) and rural areas (0.98–1.79). The final model included socio-demographic, illness and service factors, with largest effect sizes for service factors. **Conclusions:** In this synthesis, receiving palliative care was associated with lower ED attendance in the last year of life for older adults. This has implications for service models for older people nearing the end of life. However, there is limited evidence from European countries and none from low or middle-income countries, which warrants further research.

## Introduction

Most older people who are approaching the end of life prefer to be cared for and die in their usual place of care,<sup>1</sup> remaining in familiar surroundings with family nearby and autonomy preserved.<sup>2</sup> However, half of people aged 65 years and over in the USA attend the emergency department (ED) in the month before death.<sup>3</sup> Trends in the UK show that ED attendances in the last year of life are increasing.<sup>4</sup> Unplanned transitions to hospital may enable timely access to health care services, but are often distressing and associated with poor outcomes. Approximately 70% of ED visits in the last months of life end in hospital admission.<sup>3</sup> Hospitalization exposes patients to iatrogenic complications, such as hospital-acquired delirium (prevalence 6–56%)<sup>5</sup> and medication errors (median prevalence 18%)<sup>6</sup> and increases the chance of in-hospital death.

Older people, while representing a heterogeneous population group, are characterized by clinical and social factors that increase their risk of poor care at the end of life.<sup>7</sup> Living to advanced age is associated with presence of multiple chronic conditions, frailty and unpredictable illness trajectories.<sup>8</sup> This presents challenges for the care of older people, such as polypharmacy, symptom management<sup>9</sup> and uncertainty around initiating advance care planning.<sup>10</sup> Social isolation and neglect are also more common for people at older ages, which influence health service use.<sup>11</sup>

From a public health perspective, a focus on older people's ED utilization towards the end of life is important and timely, given that hospital utilization rises exponentially towards death,<sup>12</sup> and the population of older people reaching the end of life is increasing. The global population aged over 65 years is projected to more than double to 1.6 billion in the next 30 years,<sup>13</sup> presenting one of the major public health challenges of the century.<sup>14</sup> ED attendance and subsequent inpatient hospital care accounts for the highest expenditure in end of life healthcare,<sup>15</sup> while many people prefer home-based care.<sup>1</sup> It is therefore timely to understand older adults' ED use towards the end of life to optimize care provision for current and future populations.

The factors associated with ED attendance in the months preceding death for older people with non-cancer conditions have never been synthesized. A review focussed on cancer patients found that male gender, black ethnicity, lung cancer and low socioeconomic status were associated with ED attendances at the end of life.<sup>16</sup> However, as people live into advanced age there is increased prevalence of chronic non-malignant disease and multimorbidity<sup>17</sup> with different end of life trajectories and health care use.<sup>8</sup> This limits generalization of findings from patients with cancer to those with non-cancer conditions. We aimed to review factors associated with ED attendance for people aged 65 years and over within the last year of life to identify opportunities to improve end of life care.

## Methods

### Design

Systematic review following the PRISMA statement and based on a pre-agreed protocol. The review was guided by well-established theory on determinants of health service use<sup>18</sup> and of place of care at the end of life.<sup>19</sup> Andersen's behavioural theory posits that an individual's use of services is a function of 'pre-disposing', 'enabling' and 'need' factors, at individual and contextual levels.<sup>18</sup> Gomes and Higginson's model applied these theoretical principles to determinants of place of care at the end of life, categorizing factors as demographic, illness, and environment.<sup>19</sup>

### Eligibility criteria

#### Inclusion criteria

Population aged 65 years and over (at least 90% of the sample aged >65 years, or mean age of 70+ years where age range not provided); examination of one or more factors associated with outcome of ED attendance within the last year of life (including any time-period before death).

#### Exclusion criteria

Case series, case reports and qualitative study designs. Studies examining cancer patients only were excluded, because of limited generalizability from cancer populations to non-cancer populations and to allow for comparison of findings with a review on cancer patients' ED attendance towards the end of life.<sup>16</sup>

### Data sources

We searched electronic databases (Medline, Embase, PsychINFO, CINAHL and Web of Science) from inception to March 2017, with no restrictions on time or language. We searched reference lists from included and relevant studies, and articles citing these studies. We also sought to identify grey literature by searching websites of key not for profit organizations (Nuffield Trust, The King's Fund) and charitable organizations relating to end of life care (Marie Curie, Macmillan).

### Search strategy and study selection

Prior scoping in Medline and Embase ensured optimal sensitivity and specificity of the search terms (Supplementary tables S1–S5). Search results were screened initially by title and abstract, and then full text. We screened against the stated eligibility criteria at both stages. Articles for which there was uncertainty were double reviewed (A.E.B. and S.N.E.), with disagreements discussed and resolved within the research team.

### Data extraction

One reviewer (A.E.B.) extracted data according to a pre-agreed pro-forma and a 20% random sample was independently assessed for accuracy (S.N.E.). We extracted information on study design, setting, participant eligibility, population characteristics, sample size, outcome definition, statistical analysis, explanatory variables and effect sizes with confidence intervals (CIs). Unadjusted estimates were recorded only when no adjusted estimates were available.

### Quality assessment

We assessed study quality using the validated tool QualSyst, which is flexible to study design.<sup>20</sup> The assessment includes 14 criteria, each scored from 0 to 2. Percentage of the total possible score indicates quality grade: <50% low; ≥50 and <70% medium; and ≥70% high (Supplementary table S6). A second author (S.N.E.) assessed a

random 10% sample. Scores that diverged by >10% were discussed within the research team.

### Strength of evidence

We assessed the strength of evidence for each factor using an adapted existing algorithm<sup>19</sup> based on the quality, quantity and consistency of evidence (Supplementary figure S1). We independently double-assessed (A.E.B. and S.N.E.) the strength of evidence for each factor, rating each as high, moderate, low or very low.

### Data synthesis

Based on the underpinning models, we grouped factors as (i) socio-demographic and pre-disposing factors (e.g. gender); (ii) illness-related and need factors (e.g. diagnoses) and (iii) service-related and enabling factors (e.g. healthcare received).<sup>18,19</sup> We converted estimates of effect to odds ratios where possible and graphically presented adjusted estimates only, including odds ratios, risk ratios and rate ratios. We carried out a narrative synthesis of the quantitative data, reporting the range of point estimates for adjusted estimates only. Pooling estimates using meta-analysis was considered. We developed a theoretical model of ED attendance of older people in the last year of life underpinned by the principles of existing theoretical models,<sup>18,19</sup> excluding factors with very low strength evidence.

## Results

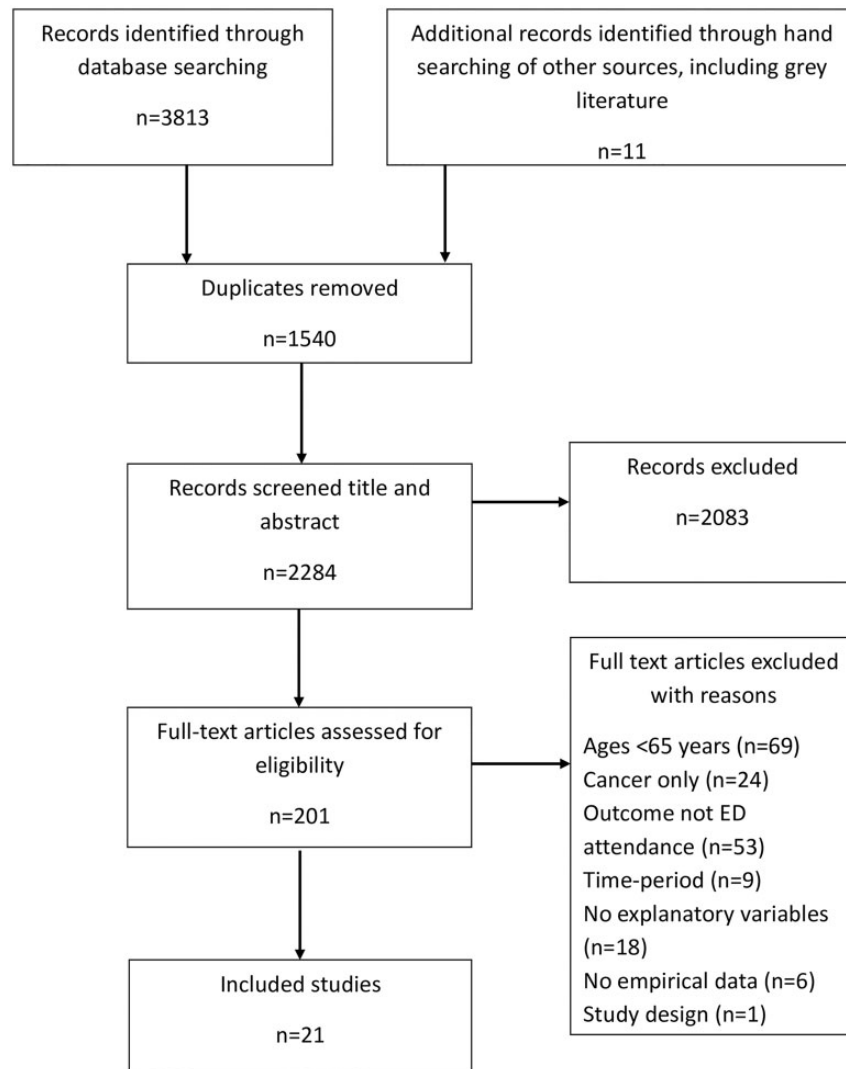
### Characteristics of included studies

We identified 3824 articles (figure 1) Following full-text screening ( $n = 201$ ) and double-review where there was uncertainty ( $n = 33$ ), 21 articles were included with a combined sample of 1 565 187 participants (table 1). Of the 21 included studies, 17 were from the USA, three from Europe and one from Australia. Just under half of the studies were rated as high quality ( $n = 10$ ) while the remaining were medium ( $n = 8$ ) or low ( $n = 3$ ) (Supplementary table S6). Most used routinely collected population-based data, with retrospective analysis (table 1, Supplementary table S7). Four studies examined interventions relating to palliative care;<sup>21–24</sup> however, none used experimental designs. Four studies examined nursing home residents only,<sup>23,25–27</sup> and one study stratified findings by nursing home and community.<sup>28</sup> Four studies focussed on single non-cancer conditions (dementia<sup>29–31</sup> and heart failure<sup>32</sup>).

Most studies defined the outcome as the proportion of people attending the ED, including those with and without a subsequent admission, while some focussed on only attendances with<sup>33</sup> or without admission.<sup>23,27</sup> Variation in definitions of the end of life time-period, and explanatory factors complicated the comparison across studies. Additionally, heterogeneity in populations and a mix of estimate measures (odds ratios and rate ratios) precluded pooling of estimates (Supplementary tables S7 and S8). Figure 2 presents the range of adjusted effect estimates for factors with high or moderate evidence. For further details, Supplementary figure S2 presents a forest plot of effect estimates with 95% CIs for selected variables, without quantitative synthesis.

### Socio-demographic factors

We found high strength evidence that men were more likely to attend ED than women in the last year of life.<sup>3,28,31,34,35</sup> In five of the six samples (all high-quality studies), men were more likely to attend ED, four significantly so with adjusted odds ratios (AORs) ranging from 1.04 to 1.83. Conversely, for one sample, community-dwelling men with dementia were less likely to attend than women (AOR 0.70). There was high strength evidence that Black, Asian and Minority Ethnic people were more likely to attend ED (versus white ethnicity), with a stronger effect observed for black ethnicity. Four



**Figure 1** PRISMA Flow diagram of study selection

high-quality studies<sup>3,28,31,34</sup> and one medium quality<sup>32</sup> examined this relationship; AORs ranged from 1.03 to 2.16. In four of the five high-quality studies reporting the effect of age, older age was associated with reduced likelihood of attending ED (moderate evidence), however these findings were mostly non-significant.<sup>3,28,31,34,35</sup> We found high strength evidence that rurality increased the likelihood of ED attendance from four high-quality studies<sup>3,28,34,35</sup>; AORs ranged from 1.57 to 1.79.

Education (one study, overall very low strength evidence)<sup>28</sup> and income (two studies, overall low strength evidence)<sup>3,28</sup> were rarely assessed, but no associations with ED attendance were reported. Two high-quality studies investigated marital status<sup>28,35</sup> finding that people living in the community with a partner were more likely to attend ED (low strength evidence).

### Service-related factors

Six studies investigated associations between receipt of community palliative care<sup>21–23,35</sup> or hospice care<sup>3,33</sup> or its timing, and ED attendance in the last year of life, including three high-quality studies. All studies found lower ED attendance in the palliative/hospice care group, with AORs ranging from 0.1 to 0.94 (high strength evidence). Three studies specifically investigated timing of palliative or hospice care, finding that early referral reduced ED attendance. Wang et al.<sup>33</sup> found that late hospice enrolment ( $\leq 7$  days before death) was associated with higher ED use compared to no hospice (AOR 1.23, 95% CI, 1.12–1.26), while

medium (8–179 days) and long length ( $>180$  days) enrolment was associated with reduced ED use (AOR 0.88, 95% CI 0.82–0.95; AOR 0.83, 95% CI 0.72–0.96, respectively).

Three high-quality studies presented the effect of being in a care home on ED attendance (AORs 0.89–0.99).<sup>3,30,31</sup> Overall, we found moderate strength of evidence for no effect. The relationship between advance care planning and ED attendance was examined in two high-quality studies,<sup>3,36</sup> both finding non-significant lower odds of attending the ED for patients with advance care planning (low strength evidence). Out of hours access to hospice physician<sup>34</sup> or advice line<sup>24</sup> were each examined by a high-quality study. These studies found no relationship and a significant reduction in ED attendance respectively (very low strength evidence).

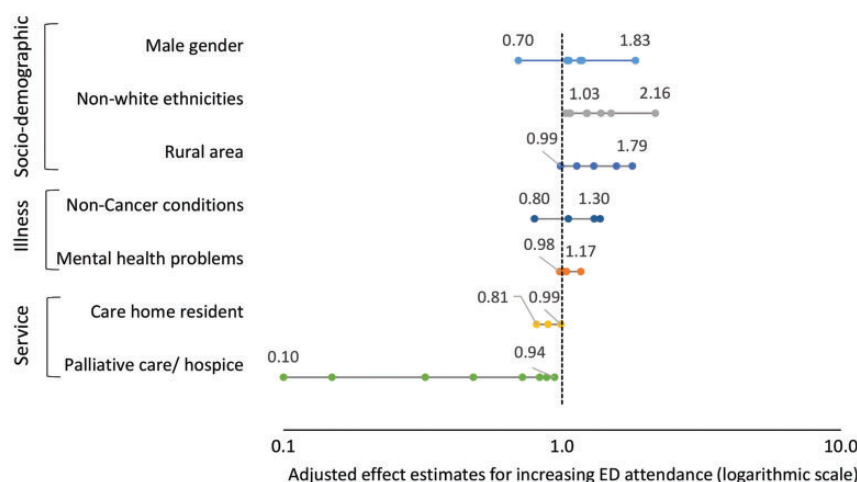
### Illness-related factors

Four studies examined primary diagnosis of cardiovascular disease,<sup>3,28,37,38</sup> three of which found cardiovascular disease increased ED attendance<sup>3,37,38</sup> (moderate strength evidence). Two studies report the effect of cancer versus non-cancer on ED attendance,<sup>3,34</sup> and two report cancer versus heart failure.<sup>37,38</sup> All found that people with non-cancer diagnoses were more likely to attend ED than those with cancer (AORs 1.05–1.37; moderate strength evidence). Two studies each examined the effect of dementia<sup>27,28</sup>, stroke<sup>3,28</sup> and lung disease<sup>3,28</sup> (versus no dementia/stroke/lung disease), and one study examined arthritis or rheumatism.<sup>28</sup> None found evidence of an association with ED attendance (low/very low strength evidence).

**Table 1** Summary of characteristics of included studies

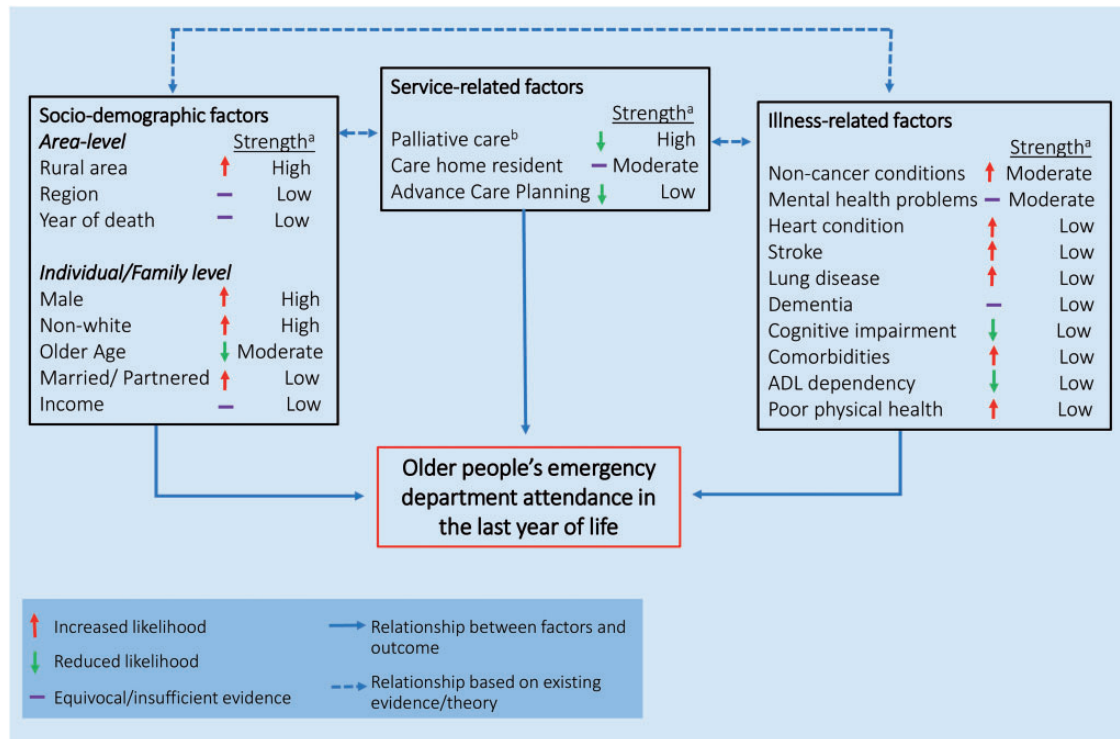
Study characteristic	Number of studies (n = 21)	Study references (first author, year) <sup>a</sup>
Study setting		
North America	17	Aldridge, 2016; Bischoff, 2013; Brumley, 2003; Cheung, 2013; Davis, 2016; Feng, 2014; Lustbader, 2017; Miller, 2015; Miller, 2016; Mitchell, 2004; Nakashima, 2016; Setoguchi, 2010; Smith, 2012; Stevenson, 2013; Unroe, 2012; Volicer, 2003; Wang, 2016.
Australia	1	Rosenwax, 2015.
Europe	3	Purdy, 2015; Morin, 2014; Sleeman, 2017.
Publication year		
2016–17	7	Aldridge, 2016; Davis, 2016; Lustbader, 2017; Miller, 2016; Nakashima, 2016; Sleeman, 2017; Wang, 2016.
2011–15	10	Bischoff, 2013; Cheung, 2013; Feng, 2014; Miller, 2015; Morin, 2014; Purdy, 2015; Rosenwax, 2015; Smith, 2012; Stevenson, 2013; Unroe, 2012.
2001–10	4	Brumley, 2003; Mitchell, 2004; Setoguchi, 2010; Volicer, 2003.
Study population diagnoses		
Mixed diagnoses	17	Aldridge, 2016; Bischoff, 2013; Brumley, 2003; Cheung, 2013; Davis, 2016; Feng, 2014; Lustbader, 2017; Miller, 2015; Miller, 2016; Morin, 2014; Nakashima, 2016; Purdy, 2015; Rosenwax, 2015; Setoguchi, 2010; Smith, 2012; Stevenson, 2013; Wang, 2016.
Dementia only	3	Mitchell, 2004; Sleeman, 2017; Volicer, 2003.
Heart failure only	1	Unroe, 2012.
Study population care setting		
Mixed	17	Aldridge, 2016; Bischoff, 2013; Brumley, 2003; Cheung, 2013; Davis, 2016; Feng, 2014; Lustbader, 2017; Mitchell, 2004; Purdy, 2015; Rosenwax, 2015; Setoguchi, 2010; Smith, 2012; Sleeman, 2017; Stevenson, 2013; Unroe, 2012; Volicer, 2003; Wang, 2016.
Care home or long-term care facility	4	Miller, 2015; Miller, 2016; Morin, 2014; Nakashima, 2016.
Time-period prior to death		
≤1 month	7	Bischoff, 2013; Lustbader, 2017; Smith, 2012; Miller, 2016; Morin, 2014; Purdy, 2015; Setoguchi, 2010.
>1 month and ≤3 months	4	Miller, 2015; Mitchell, 2004; Nakashima, 2016; Volicer, 2003.
>3 months and ≤6 months	1	Wang, 2016.
>6 months and ≤12 months	5	Davis, 2016; Feng, 2014; Rosenwax, 2015; Sleeman, 2017; Stevenson, 2013.
From hospice enrolment to death	4	Aldridge, 2016; Brumley, 2003; Cheung, 2013; Unroe, 2012.
Outcome of interest		
Proportion any ≥1 ED visit	12	Aldridge, 2016; Cheung, 2013; Feng, 2014; Miller, 2015; Morin, 2014; Mitchell, 2004; Purdy, 2015; Setoguchi, 2010; Sleeman, 2017; Smith, 2012; Unroe, 2012; Volicer, 2003.
Proportion any >1 ED visit	1	Bischoff, 2013.
Proportion ≥1 ED visit without admission	2	Miller, 2016; Nakashima, 2016.
Proportion ≥1 ED visit with admission	1	Wang, 2016.
Mean number of any ED visits	1	Brumley, 2003.
Mean number of ED visits without admission	1	Davis, 2016.
Daily rate of any ED use	1	Rosenwax, 2015.
Any ED visits per 1000 decedents	2	Lustbader, 2017; Stevenson, 2013.
Study quality		
High	10	Aldridge, 2016; Bischoff, 2013; Feng, 2014; Miller, 2016; Mitchell, 2004; Nakashima, 2016; Purdy, 2015; Rosenwax, 2015; Sleeman, 2017; Smith, 2012.
Medium	8	Brumley, 2003; Cheung, 2013; Davis, 2016; Miller, 2015; Setoguchi, 2010; Stevenson, 2013; Unroe, 2012; Wang, 2016.
Low	3	Lustbader, 2017; Morin, 2014; Volicer, 2003.

<sup>a</sup>All references for included studies are presented in [Supplementary table S6](#).



**Figure 2** Adjusted effect estimates for socio-demographic, illness and service factors with high and moderate strength of evidence. Numbers detail minimum and maximum adjusted effect estimates for each factor





**Figure 3** Model of factors related to emergency department attendance by people aged 65+ years in the last year of life. <sup>a</sup>Strength of evidence, graded according to algorithm; <sup>b</sup>palliative care includes specialist, generalist or hospice care; ADL=activities of daily living

Three high-quality studies reported the relationship between mental health and ED attendance, finding no evidence of effect (moderate strength evidence).<sup>28,31,34</sup> One study examined depression among dementia patients and found a significant association with higher likelihood of ED attendance.<sup>31</sup>

We found little evidence that number of comorbidities was associated with ED<sup>28,34</sup> (low strength evidence). One study examined the effect of having different comorbidities alongside dementia, and found positive associations with ED attendance, with the strongest effect for hypertension (very low strength evidence).<sup>35</sup> There was low strength evidence that cognitive impairment was associated with lower ED attendance<sup>3,31</sup> and very low strength evidence relating to physical symptoms (pain).<sup>3</sup>

### *Theoretical model of older adults' ED attendance in the last year of life*

We present the synthesized findings in figure 3. Service-related factors include factors potentially amenable to modification by policy, commissioners, or practitioners. The socio-demographic factors represent area- or individual-level targets for services, while the illness-related factors are potential targets for intervention at a clinical level. The solid lines represent associations from our findings, while dotted lines represent associations between the factor groups based on existing evidence or theory. There is evidence that socio-demographic and illness factors are related to access to services. For example, older patients, ethnic minority patients and non-cancer primary diagnoses are each associated with lower access to specialist palliative care services.<sup>39–41</sup> Similarly, there are well-established relationships between socio-demographic factors, particularly age and gender, and illness factors such as diagnoses and comorbidities.<sup>42</sup>

## **Discussion**

In this systematic review, we extend knowledge by synthesizing evidence from 21 studies including more than 1.5 million older people, to identify service-related, socio-demographic, and illness-

related factors that are associated with ED attendance towards the end of life. Identifying service factors is of particular importance given that such factors are amenable to change. We present the strongest evidence to date that provision of palliative or hospice care to older people is associated with lower ED attendance within the last year of life with mostly large effect sizes, and that earlier provision strengthens this relationship. This corroborates findings from a randomized controlled trial (RCT) of home palliative care for older people expected to be towards the end of life, which showed significant reductions in ED attendance.<sup>43</sup> This finding has potential implications for service development for older people with non-cancer conditions, who have historically not been the primary recipients of specialist palliative care.

We found low strength evidence that advance care planning or discussing preferences for place of care is associated with lower ED attendance for older people towards the end of life, indicating that high-quality future research is required to understand this relationship. For family members who expected their relative to die, the odds of attending ED were lower than those who did not expect it. These findings suggest that recognition of end of life is important, and family is key to involve in end of life discussions.

Provision of community care by generalist nurses and physicians is likely to be an important factor relating to ED attendance, but was not considered among included studies. A previous systematic review on determinants of ED visits among older people (not necessarily towards the end of life) found that perceived low availability of physicians was related to greater ED use.<sup>44</sup> There is also an important gap in evidence on the impact of 'general palliative care' provision by primary care practitioners, who are typically older adults' main care providers. In addition, whether variation in social care explains ED attendance towards the end of life was not reported, despite over a quarter of people receiving social care in the last year of life, and the proportion increasing with age.<sup>15</sup>

Examination of socio-demographic and illness factors are important for understanding inequalities in care and to identify

potential targets for services. We found high strength evidence that male gender, and black or minority ethnicity increased likelihood of attending ED towards the end of life. A surprising finding was the high strength of evidence for people in rural areas being more likely to attend ED than in urban areas, despite lower proximity to hospitals. These results do however corroborate findings for cancer patients only, increasing confidence in these findings.<sup>16</sup> We found little evidence on patient-reported factors such as breathlessness and anxiety, which are potentially key to our understanding of why older people present to the ED towards the end of life. Breathlessness is a prominent symptom in advanced disease, which can be distressing for patients and their families. Qualitative research has found disease-related anxiety to be an important factor contributing to cancer patients' ED attendance towards the end of life.<sup>45</sup>

Three-quarters of included papers were published in the last five years, demonstrating an increasingly strong evidence base, but gaps in our understanding remain. The evidence is predominantly from the USA, based on large routinely collected datasets. It is important to interpret the findings with this context in mind, given the differences between the health system in USA and elsewhere. Despite knowledge that hospitalizations in the last year of life are common across European countries,<sup>46</sup> few studies examining ED attendance were conducted in European countries and there is a notable lack of evidence from low- or middle-income countries. Most factors with high strength evidence were those that are easily measurable in routine data, not necessarily those that are most clinically important, or amenable to change.

There has been a recent move to include ED attendance as a quality indicator for end of life care. In North America, ED attendance is already included as a key measure of intensity of end of life care for cancer patients.<sup>16</sup> However, whether or not high ED attendance is a cause or consequence of poor quality care is untested. Qualitative research has found that cancer patients and carers perceive hospital as a place of safety and security during times of crisis and when care at home breaks down.<sup>45</sup> There is limited investigation of the views of older people with non-cancer conditions on ED attendance towards the end of life, which is a key area for future research.

A strength of this review is its robust and systematic methods, which enabled comprehensive review of the evidence, with no restrictions on time or language. Building on existing theoretical models, this study has developed our understanding of ED attendance of older people, including non-cancer conditions, a group which has previously been excluded. Including older people with varying diagnoses and not focussing on a single disease type is a strength, as it is more reflective of the population of older people who increasingly have multiple problems and conditions. We extracted data on both significant and non-significant associations to minimize bias against negative findings.

This systematic review also has limitations. It was not possible to make judgement about the appropriateness of ED admissions with the data available. The strict focus on the last year of life for comparability meant that the inclusion of studies was weighted towards observational studies, as RCTs at the end of life are less commonly conducted and less likely to follow patients until death. Synthesis across studies was limited by the variation in outcome definitions, time-period before death, and population heterogeneity, precluding meta-analysis. Additionally, causation between identified factors and ED attendance cannot be inferred due to the nature of the evidence. The dominance of evidence from the USA limits the generalizability of our findings to other countries.

## Conclusions

Receiving palliative or hospice care is associated with lower ED attendance in the last year of life for older adults. These services may enable older people to remain in their usual place of care and

reduce unplanned hospital ED attendance, in line with their preferences, by receiving timely care and treatment responsive to changing needs. Focussing on improving access to palliative or hospice care for non-cancer populations, and non-white ethnicities may also reduce the inequalities we observed in end of life care. Our understanding of what drives the association between palliative or hospice care services and ED in the last year of life remains limited, suggesting a need for better evidence on the effectiveness of models of community care for older adults towards the end of life. There is also a need for better high-quality international evidence on factors associated with older people's ED attendance from other European countries and beyond, particularly in low- and middle-income countries, to optimize end of life care in different healthcare systems.

## Supplementary data

Supplementary data are available at *EURPUB* online. See *Supplementary data* for additional references (41–46).

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## Disclaimer

The views expressed in this publication are those of the author(s) and not necessarily those of the NHS, the National Institute for Health Research or the Department of Health.

*Conflicts of interest:* None declared.

## Key points

- We have synthesized evidence from 21 studies including over 1.5 million people on factors associated with ED attendance for older people towards the end of life.
- Palliative/hospice care is associated with reduced ED attendance, supported by high strength evidence and mostly large effect sizes, suggesting that investment in these services for older people may prevent ED attendance towards the end of life.
- Non-white ethnicity, male gender, living in a rural area and non-cancer conditions are associated with higher ED attendance, highlighting inequalities in end of life care that require further attention.

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